R E P O R T R E S U M E S

ED 015 659 EM 005 382

MASTER TELEVISION ANTENNA SYSTEM.
RHODE ISLAND STATE DEPT. OF EDUCATION, PROVIDENCE
EDRS PRICE MF-$0.25 HC-$0.72 16P.

DESCRIPTORS- *SECONDARY SCHOOLS, *ELEMENTARY SCHOOLS, *EQUIPMENT STANDARDS, *EDUCATIONAL TELEVISION, PERFORMANCE, *EQUIPMENT UTILIZATION

SPECIFICATIONS FOR THE FURNISHING AND INSTALLATION OF TELEVISION MASTER ANTENNA SYSTEMS FOR SECONDARY AND ELEMENTARY SCHOOLS ARE GIVEN. CONTRACTOR REQUIREMENTS, EQUIPMENT, PERFORMANCE STANDARDS, AND FUNCTIONS ARE DESCRIBED. (MS)

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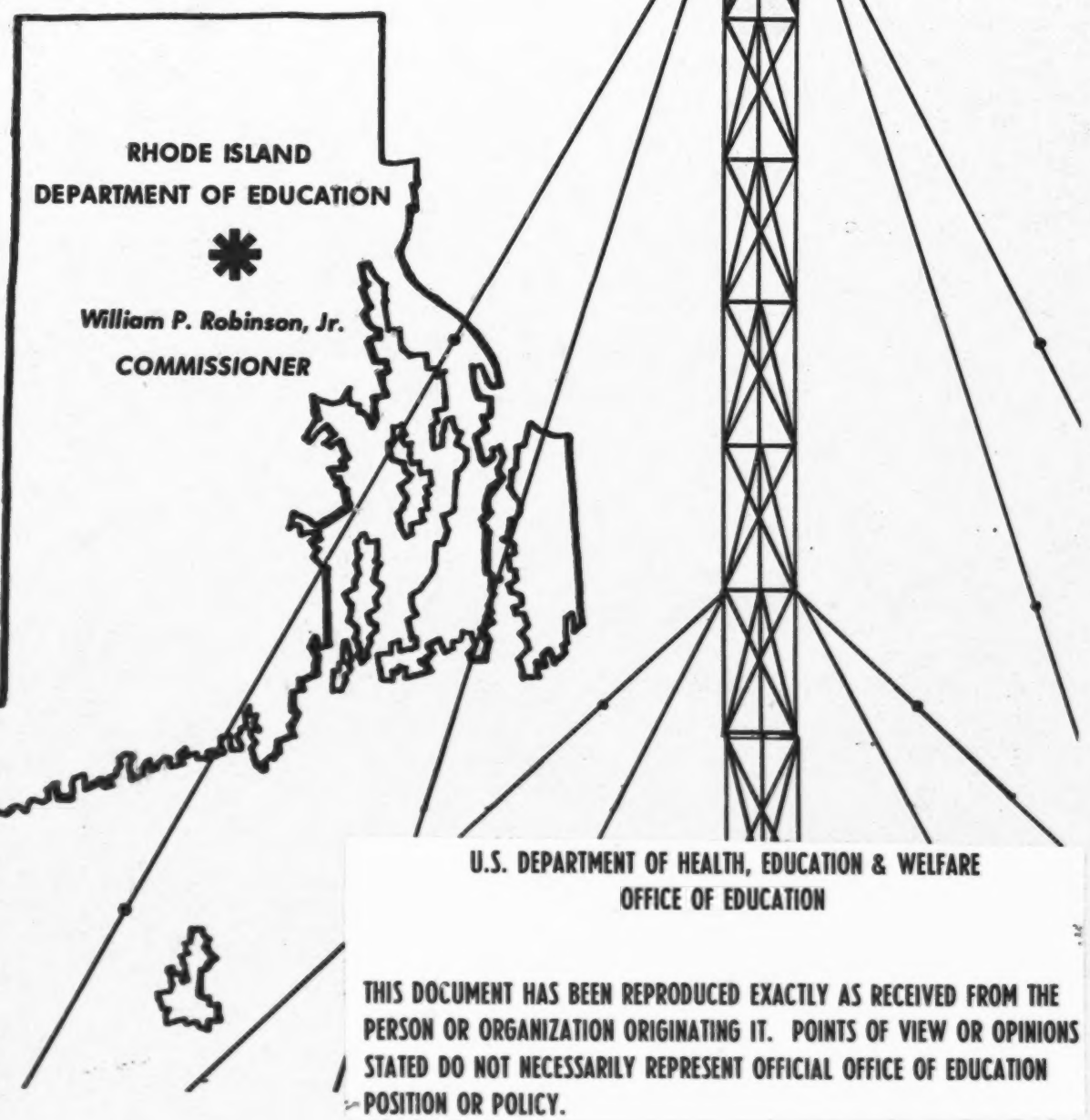
MASTER TELEVISION ANTENNA SYSTEM



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OFFICE OF EDUCATION

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MASTER TELEVISION ANTENNA SYSTEM
Recommended for Secondary Schools
(Senior High and Large Junior High)

A. GENERAL REQUIREMENTS

These specifications cover and include the furnishing and installation of a television master antenna system as hereinafter specified. The work under this specification shall consist of furnishing all labor, materials, equipment and appliances for the complete installation of the television system, all in accordance with these specifications and applicable drawings.

1. The system shall be complete, ready for operation to permit use of a television receiver at each outlet location.

2. All work shall be done by or under the supervision of a factory authorized organization. It shall be the responsibility of this organization to check and inspect this installation and train the owners' personnel on the proper operation of the system.

3. The T.V. System Contractor shall show satisfactory evidence that he maintains a fully equipped organization capable of furnishing adequate inspection and service to the system including standard replacement parts. The T.V. System Contractor shall be prepared to offer a post-warranty maintenance (service contract) on a contract or call basis after the guarantee period.

4. The contractor shall furnish the owner illustrations, descriptive specifications and engineering data of the equipment he proposes to furnish under these specifications, together with engineering drawings showing the layout of the system, and subject to approval by the owner.

5. The contractor shall furnish a set of operating instructions including circuit diagrams and other information necessary for proper installation, operation and maintenance.

6. The installation shall be in accordance with the latest requirements of the National Electrical Code, State and local codes, ordinances and regulations of any other governing body having jurisdiction.

7. The contractor may offer equipment or material presenting improvements or additional guarantees such as to insure better service or may offer standard equipment, which may not be fully in accord with these specifications in regard to points of secondary importance. However, all such points of divergence shall be fully explained and justified. In all cases the overall performance shall take predominance over the performance of any individual unit.

B. GUARANTEE

The Contractor shall guarantee the system will provide consistent

peak performance for a period of one (1) year from date of acceptance by the owner. Maintenance including all labor and material necessary to provide proper performance, excluding defects caused by abuse of or changes made in transmitting or channel conditions, to be at no expense to the owner.

C. T.V. SYSTEM PERFORMANCE STANDARDS

1. A system VSWR less than 1.3 for RF reception television and a system VSWR of 1.1 where video uses are to be employed.

2. A minimum RF isolation between any receiver and the cable of 16 db at any TV channel (32 db minimum isolation between any two receivers to prevent set interaction or interference.

3. A minimum signal level at any receiver outlet of 2000 microvolts at 75 ohms for any TV channel (2-13.) (Necessary for absence of noise and extraneous pickup.)

4. All electronic equipment shall be designed and rated for 24 hours per day continuous operation.

5. A system bandwidth through coaxial cable and access units of 0 to 220 mcs, flat within 1 db across any 6 mc part of this spectrum employing video information (essential for full color transmission.)

D. FUNCTIONS

1. Master TV Antenna System shall provide reception of educational TV channels 36, commercial channels 10, 12, 6, (Channel 36 to be converted to channel 3.)

2. Provisions are to be made for the future reception of educational transmission on the 2500 MC instructional television band.

3. Educational closed-circuit remote camera input system shall be remote multiple input cable systems that will provide the means of transmitting television picture and sound programs from any of the remote pickup points to the rack.

4. Master off-air and closed-circuit control system shall:
   a. Receive Channels 36, 10, 12, and 6 off-air programs.
   b. Receive closed-circuit system signals from all rooms or remote pickup points on the educational system.
   c. Provide for control selections of programs.
   d. Provide control of all signals in the master distribution and closed-circuit systems.

5. Microwave and cable input facilities provided for at rack so that future video and audio information from program sources cabled or microwaved into school can be received on all the TV receiver outlets.

6. Cueing audio circuit between all TV combination outlets and/or rack.

E. EQUIPMENT

1. VHF Antennas shall be ruggedized yagi type for each channel specified. High band units to be ten elements and low band units to be five elements. All elements to be of ½" seamless aluminum tubing with 5/8" reinforcing sleeves. Boom to be not less than 1¼" 1.062 square tubing. All tubing to be seamless iridited 6061-T6 aluminum. Mast clamp shall accomodate up to 2" O.D. masts. Elements and boom shall be completely sealed to prevent internal moisture build-up. Longer low band elements shall be sandloaded to minimize vibration effects. High band gain shall be at least 10 db and low band gain shall be at least 8 db as compared to a reference dipole. Antenna and masts shall be properly grounded. Antenna shall be mounted on two 1½" x .125 x 12' 6061-T6 aluminum masts which shall be attached as indicated on plan.

2. UHF Antenna shall be a 12-element triple driven yagi with screen grid reflector.

3. UHF Antenna Matching Transformers shall be weatherproof and flat over the entire UHF spectrum (470-890 mc.) Masimum insertion loss from 0.6 db at 470 mc to 1.2 db at 890 mc.

4. Antennae supplies must be equal to the performance of that described in the above specification.

5. UHF Preamplifiers shall be supplied where required. It shall have at least 14 db gain, with a minimum input of 350 w volts across 300 ohms. It shall have a maximum output of 140,000 uv per channel for 2 channels at 0.5% modulation. Unit shall be powered from a remote power supply - power supply to be doubly filtered and include a neon pilot light, twist lock fuse, on-off switch and a cable length switch for use with varying cable lengths.

6. UHF Converter shall consist of two units, an antenna mounted VHF head and a separately mounted local oscillator and power supply. It shall use a double cavity tuned VHF input, a crystal mixer stage, and a crystal controlled oscillator for stability. It shall have an oscillator stability of 0.005%.

7. VHF Preamplifiers

Shall be single channel with a minimum gain of 28 db, and the noise figure shall not exceed 6 db on the low VHF channels nor 8 db on the high VHF channels. This unit shall be capable of supplying an undistorted output of .5 volts rms across 72 ohms. Input and output impedances shall be 72 ohms. Each amplifier shall have a self-contained power supply for operation on 110 volt, 60 cycle, AC.

8. Distribution Amplifiers & Power Supply

The TV master amplifier shall be of the single channel strip type or self-contained power supply type. The frequency response of each channel strip shall be flat within plus or minus ½ db across the entire 6 megacycle band. The channel amplifiers shall have a minimum gain of 33 db for the low VHF channels and 28 db for the high

VHF channels. The amplifier shall incorporate a self-biasing circuit, automatically stabilizing gain of the amplifier and compensation for the tube aging. Each amplifier strip shall have one matched 72 ohm input and two matched 72 ohm outputs. Each amplifier strip shall be capable of supplying a m aximum output signal of 1.5 volts rms at each of two outputs.

Power supply shall be line regulated, providing 150V B+ at 300 MA, capable of supplying required power to maximum of eight strip amplifiers.

9. TV Access Units

Each unit shall consist of receptacle, cover plate, and mating continuity plug where plugs are used. Receptacles shall mount on coaxial cable without soldering or splicing. Installation shall be foolproof and permanent. Receptacles shall mount in standard 3 gang boxes.

10. TV Receptacles and RF Tap-Off Units

a. Where plugs are used they shall be locked to receptacles by tamperproof bolts. Receiver outlets shall be furnished as determined by the owner. The isolation of the outlets shall be a minimum of 16 db from set to line and 32 db between receivers. The insertion loss shall not exceed .5 db at channel frequency. Outlet shall be capable of feeding two receivers at the same time.

b. Video unit shall be capable of feeding an RF receiver and have a video output and input. By using this unit, it shall be possible to insert closed-circuit signals and simultaneously receive the "Off-Air" programs.

11. TV Cover Plates

Three-gang cover plates with separate audio outlet shall be furnished for use with TV receptacles, one for each TV receptacle location.

12. Control Panel

Panel shall provide for the insertion or removal of video or audio signal from one or all zones, without the interruption of normal RF or closed-circuit signals. All fittings shall be silver-coated. Insertion loss per zone shall not exceed 1 db. Isolation between outputs shall be 30 db minimum.

13. Line Splitters

Splitters shall be designed with RG 6A/U type of cable fittings. Connector contacts shall be silver coated. The unit shall have a 72 ohm match in all directions.

14. Filters, Traps, Frequency Separators

Assemblies shall be matched in all directions, employing high "Q" circuits and designed for RG-59 cable fittings. Connector contacts

shall be silver coated. The assembly shall be enclosed in a radiation-proof container.

15. Set Cables

_____ outlet to receiver connecting cables shall consist of 8' coaxial cable with matching fitting for TV outlet and matching 72-300 ohm transformer.

16. Cable

a. Antenna cable shall be RG-59U coaxial type.

b. TV coaxial distribution cable shall be RG 6A/U type, or approved equal, with O.D. .332". (Note: The use of double shield cable is specified to insure complete freedom from interaction when more than one cable is run in the same conduit and to fully protect any cable run exposed in ceilings or basements from noise or interference pickup.)

c. Audio-cable shall be two wire shielded and stranded Belden #8762 or equal.

DEMODULATORS

Demodulators shall incorporate the latest circuitry to provide E. I. A. quality video and audio signals for both black and white and NTSC color. Tuner shall provide for conversion of all VFH Channels.

TUNER SPECIFICATIONS

Electrical

Overall -
Sensitivity ... 16 microvolts (-36 dbj) input for 1.5 v p-p output (manual or AGC)
AGC. ... 1 db video level change for +36 dbj change
Tuner
- Frequency range.....VHF Channels 2 to 13
- Noise figure..... 7 db maximum
- Impedance..... 75 ohms
- Gain (input to first I. F.) ..... 75 ohms
- Maximum input..... 64,000 microvolts (+36 dbj)

Shaper and I. F.
- Frequency range ..... 41-47 mc
- Adjacent channel rejection ..... 60 db

On Channel Sound Carrier
- Reduction..... 26 db minimum (below video carrier)
- Gain Control..... Manual or keyed AGC
- Impedance..... 75 ohms
  - Test Points... Cathode voltage; each I. F. stage, and grid bias ("VG")

Video
- Frequency Response..... 30 cps to 4.0 mc within 1 db
- Output level (operational)..... 1.5 v p-p into 75 ohms (sync negative)
- 4.5 mc trap..... 30 db rejection
- Co-channel traps (8-12 kc, 18-22 kc) ..... 30 db rejection
- Output Attenuator..... 3, 6, 12 db (21 db)
  - Impedance..... 75 ohms
  - Video test..... 26 db down with output terminated in 75 ohms.

Sound
- System..... Inter-carrier
- Output level (audio) ..... 0.5 v rms into 75 ohms

Miscellaneous
- Power Supply..... Self-contained, with Sola line voltage regulating transformer

Squelch ..... Operates on signal-off condition (squelches video cathode followers; and 4.5 db limiter, relay operates auxiliary S.P.D.T. switch-contacts on rear)

MODULATORS

All Modulators shall incorporate the latest circuitry to provide vertical side band transmission of selected R.F. channels. It shall be equipped with a 4.5. MC FM Modulator. It shall meet the following specifications:

VIDEO

Electrical
Frequency Range
VHF Channels 2 through 6
Output Levels (Operational)
Visual . . . 57 db above 1 millivolt level across 75 ohms
Aural . . . 51 db above 1 millivolt level across 75 ohms
Sideband Attenuation
Pic-carrier minus .75 mc.
2 db+ 1 db
Pic-carrier minus 1.25 mc.
-20 db + 2 db
Pic-carrier minus 3.58 mc.
-42 db + 3.58 db
Adj. channel pic-carrier
-20 db + 1 db
Carrier Frequency Stability
Visual 005%
Aural . . . a. When the aural input to the TM Modulator is supplied by the TD Demodulator, the visual carrier frequency difference tolerance is determined by the broadcaster of the channel the TD is receiving.
Frequency Response
Visual . . . 30 cps to 4 mc + 0.5 db - 10 db at 4.5 mc
Aural . . . a. When the aural input to the TM Modulator is supplied by the TD Demodulator the aural frequency response of the TM is determined by the broadcaster of the channel the TD is receiving.

Input Impedance
Visual ... 75 ohms
Aural .....75 ohms
Output Impedance
Visual .. 75 ohms, VSWR 1.3
Aural ... 75 ohms, VSWR 1.3
Modulation Capabilities
Visual ..Variable 0% to 100%
Aural...a. When the aural input to the TV Modulator is supplied by the TD Demodulator the aural modulation capability is determined by the broadcaster of the channel the TD Demodulator is receiving.

Electrical

Output Level (4.5 MC)
3 volts P/P, across 75 ohms
Input Impedance... 100,000 ohms
Output Impedance... 75 ohms
Frequency... 4.5 mc, + 1 kc.
Modulation Capabilities
At 100% modulation (+25 kc), harmonic distortion a maximum of 2% from 50 to 15,000 cps. At a + 50 kc swing, harmonic distortion a maximum of 5% from 50 to 15,000 cps.
Pre-Emphasis
Within + 1 db of standard used. pre-emphasis curve.

Modulation Sensitivity
50 mx equals 100% modulation (+ 25 kc swing) at 400 cps
FM Noise Level
Greater than *50 db below 100% modulation.
Power Requirements
Supplies by Modulator: +145 VDC @ 25MA 5.9 VAC @ 1.5 ampx.
Tube Complement
(1) 6AW8, (2) 6AU6, (1) 6AL6, (1) OB2

MASTER TELEVISION ANTENNA SYSTEM
Recommended for Elementary Schools

A. GENERAL REQUIREMENTS

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1. The system shall be complete, ready for operation to permit use of a television receiver at each outlet location.

2. All work shall be done by or under the supervision of a factory authorized organization. It shall be the responsibility of this organization to check and inspect this installation and train the owners' personnel on the proper operation of the system.

3. The T.V. System Contractor shall show satisfactory evidence that he maintains a fully equipped organization capable of furnishing adequate inspection and service to the system including standard replacement parts. The T.V. System Contractor shall be prepared to offer a post-warranty maintenance (service contract) on a contract or call basis after the guarantee period.

4. The contractor shall furnish the owner illustrations, descriptive specifications and engineering data of the equipment he proposes to furnish under these specifications, together with engineering drawings showing the layout of the system, and subject to approval by the owner.

5. The contractor shall furnish a set of operating instructions including circuit diagrams and other information necessary for proper installation, operation and maintenance.

6. The installation shall be in accordance with the latest requirements of the National Electrical Code, state and local codes, ordinances and regulations of any other governing body having jurisdiction.

7. The contractor may offer equipment or material presenting improvements or additional guarantees such as to insure better service or may offer standard equipment, which may not be fully in accord with these specifications in regard to points of secondary importance. However, all such points of divergence shall be fully explained and justified. In all cases the overall performance shall take predominance over the performance of any individual unit.

B. GUARANTEE

The Contractor shall guarantee the system will provide consistent peak performance for a period of one (1) year from date of acceptance by the owner. Maintenance including all labor and material necessary to provide proper performance, excluding defects caused by abuse of or changes made in transmitting or channel conditions, to be at no expense to the owner.

C. TV SYSTEM PERFORMANCE STANDARDS

1. A system VSWR less than 1.3 for RF reception television and a system VSWR of 1.1 where video uses are to be employed.

2. A minimum RF isolation between any receiver and the cable of 16 db at any TV channel (32 db minimum isolation between any two receivers to prevent set interaction or interference.

3. A minimum signal level at any receiver outlet of 2000 microvolts at 75 ohms for any TV channel (2-13). (Necessary for absence of noise and extraneous pickup.)

4. All electronic equipment shall be designed and rated for 24 hours per day continuous operation.

5. A system bandwidth through coaxial cable and access units of 0 to 220 mcs, flat within 1 db across any 6 mc part of this spectrum employing video information (essential for full color transmission).

D. FUNCTIONS

1. Master TV Antenna System shall provide reception of educational TV Channel 36 commercial Channels 10, 12, and 6, (Channel 36 to be converted to Channel 3.)

2. Provisions are to be made for the future reception of educational transmission on the 2500 mc instructional television band.

3. An audio circuit between all TV outlets and control location.

4. Use of closed-circuit video and/or RF origination shall be possible without any change in the distribution system.

E. EQUIPMENT

1. VHF Antennas shall be ruggedized yagi type for each channel specified. High band units to be ten elements, and low band units to be five elements. All elements to be of 1/2" seamless aluminum tubing with 5/8" reinforcing sleeves. Boom not to be less than 1-1/4" 1.062 square tubing. All tubing to be seamless iridited 6061-T6 aluminum. Mast clamp shall accomodate up to 2" O.D. masts. Elements and boom shall be completely sealed to prevent internal moisture build-up. Longer low band elements shall be sand loaded to minimize vibration effects. High band gain shall be at least 10 db, and low band gain shall be at least 8 db as compared to a reference dipole. Antenna shall be equipped with a 75 ohm gamma match output with integral weather protected coaxial fitting. Antenna and masts shall be attached as indicated on plan.

2. UHF Antenna shall be a 12-element triple driven yagi with screen grid reflector or equal.

3. UHF Antenna Matching Transformers shall be weatherproof and flat over the entire UHF spectrum (470-890 mc). Maximum insertion loss from 0.6 db at 470 mc to 1.2 db at 890 mc.

4. Antennas supplied must be equal to the performance of that described in the above specification.

5. UHF Preamplifiers shall be supplied where required. It shall have at least 14 db gain, with a minimum input of 350 microvolts across 300 ohms. It shall have a maximum output of 140,000 nv per channel for 2 channels at 0.5% modulation. Unit shall be powered from a remote power supply - power supply to be doubly filtered and include a neon pilot light, twist lock fuse, on-off switch and a cable length switch for use with varying cable lengths.

6. UHF Converter shall consist of two units, an antenna mounted VHF head and a separately mounted local oscillator and power supply. It shall use a double cavity tuned VHF input, a crystal mixer stage, and a crystal controlled oscillator for stability. It shall have an oscillator stability of 0.005%. It shall be a solid-state unit.

7. VHF Preamplifiers shall be single channel with a minimum gain of 28 db, and the noise figure shall not exceed 6 db on the low VHF channels nor 8 db on the high VHF channels. This unit shall be capable of supplying an undistorted output of .5 volts rms across 72 ohms. Input and output impedances shall be 72 ohms. Each amplifier shall have a self-contained power supply for operation on 110 volt, 60 cycle AC. Amplifier to be solid state.

8. Master Amplifier

The Master Amplifier shall amplify the signal received from those channels specified. Amplifier shall have high and low locking gain controls, high and low tilt controls for cable compensation, ground clamps for lightning protection. It shall be a transistorized, solid-state unit.

Gain:	38 db min.
Gain Controls:	16 db range Hi and Lo bands
Tilt Controls:	Hi and Lo bands
Rated Output (max.):	.3V/channel for 9 channel operation
Rated Input (max.):	26000 uv.
Cable Fittings:	75 ohms
Fuses:	Primary - 1 amp.
Power Requirements:	117 volts AC; 63 watts

9. TV Access Units

Each unit shall consist of receptacle, cover plate, and mating continuity plug. Receptacles shall mount on coaxial cable without soldering or splicing. Installation shall be foolproof and permanent. Receptacles shall mount in standard 3-gang boxes.

10. TV Receptacles and RF Tap-Off Units

a. Plugs shall be locked to receptacles by tamperproof bolts. Receiver outlets shall be furnished as determined by the owner. The isolation of the outlets shall be a minimum of 16 db from set to line and 32 db between receivers. The insertion loss shall not exceed .5 db at channel frequency. Outlet shall be capable of feeding two receivers at the same time.

b. Video unit shall be capable of feeding an RF receiver and have a video output and input. By using this unit, it shall be possible to insert closed-circuit signals and simultaneously receive the "Off-Air" programs.

11. TV Cover Plates

Three-gang cover plates with separate audio outlet shall be furnished for use with TV receptacles, one for each TV receptacle location, finished in brushed stainless.

12. Control Panel

Panel shall provide for the insertion or removal of video or audio signal from one or all zones, without the interruption of normal RF or closed-circuit signals. All fittings shall be silver-coated. Insertion loss per zone shall not exceed 1 db. Isolation between outputs shall be 30 db minimum.

13. Line Splitters

Splitters shall be designed with RG 6A/U type of cable fittings. Connector contacts shall be silver coated. The unit shall have a 72 ohm match in all directions.

14. Filters, Traps, Frequency Separators

Assemblies shall be matched in all directions, employing high "Q" circuits and designed for RG-59 cable fittings. Connectors contacts shall be silver coated. The assembly shall be enclosed in a radiation-proof container.

15. Set Cables

_____ outlet to receiver connecting cables shall consist of 8' coaxial cable with matching fitting for TV outlet and matching 72-300 ohm transformer.

16. Cable

a. Antenna cable shall be RG-59U coaxial type.

b. TV coaxial distribution cable shall be RG 6A/U type, or approved equal, with O.D. .332". (Note: The use of double shield cable is specified to insure complete freedom from interaction when more than one cable is run in the same conduit and to fully protect any cable run exposed in ceilings or basements from noise or interference pickup.)

c. Audio cable shall be two wire shielded and stranded Belden 8762 or equal.

END

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